

# The Clark Cabin Model

## Instructions and Plans for Building an Unusual Flying Plane

By Jack Clark



"Out of the West"  
The Clark Model in full flight at Portland, Oregon

**I**N THIS article we shall describe the construction of a very light and rugged model that has good altitude and distant qualities as well as easy landing ability.

Its features are sheet balsa wheel pants, demountable nose and tail plugs instead of a motor-stick, three-unit wing construction, and a split-axle landing gear that spreads when the plane lands.

You will require the following material for this model:

Material.	Where Used.
1 piece balsa, 1/32 x 1/16 x 12.	Window molding, tail bracing.
2 pieces balsa, 1/16 x 1/16 x 24.	Fuselage bracing, tail and rudder.
1 piece balsa, 1/16 x 3/32 x 30.	Front fuselage bracing, rudder.
3 pieces balsa, 1/16 x 1/8 x 36.	Wing spars and edges, tail, rudder, etc.
1 piece balsa, 1/16 x 3/16 x 30.	Wing main spar, tail center rib.
5 pieces balsa, 3/32 x 3/32 x 36.	Fuselage longerons, cross-bracing, etc.
1 piece balsa, 1/8 x 1/8 x 2 1/2.	Landing gear strut hinge blocks.
1 piece balsa, 1/8 x 1/4 x 4.	Hanger support, cabin edge, tail skid.
1 piece balsa, 3/16 x 3/8 x 2.	Wheel pant sides spacers.
1 piece balsa, 1/4 x 1/4 x 13/16.	(Tail plug.)
1 piece balsa, 3/8 x 7/16 x 1.	(Tail plug.)
1 piece balsa, 1/4 x 1 1/16 x 1 1/4.	(Nose plug.)
1 piece balsa, 1/8 x 1 1/16 x 1 9/32.	(Nose plate.)
1 piece balsa, 5/8 x 1 x 7 1/2.	(Propeller block.)
1 piece balsa, 1/16 x 1 1/2 x 30.	All parts specified 1/16 sheet.
1 piece balsa, 1/32 x 3 x 24.	All parts specified 1/32 sheet.
2 pieces bamboo, 1/16 x 1/4 x 15.	All parts specified bamboo.

1 piece pine, 1/16 x 1/8 x 2. Axle guide.  
One ounce bottle of colorless airplane cement.  
One ounce bottle of wing dope (50% nitrate dope, 50% acetone).

2 sheets "Superfine Japanese tissue," 18 x 21.  
1 sheet, medium weight rice paper. (About 5 x 9.) For nose 40 inches of No. 10 music wire (.024"). For all wire parts except "e" small piece of No. 8 music wire (.020"). For hanger brace "e" only, on nose plug. (Drawing No. 1.)

6 1/4" diameter washers. To fit No. 10 wire for wheels and propeller shaft.

2 thrust bearings, steel. (Refer to Drawing No. 1 for sizes.)

1 thin piece of tin or brass, 1/4 x 1 1/16. Bearing plate for rear or propeller hub (Drawing No. 6).

1 piece of 3/32 outside diameter brass tubing. For propeller shaft (Drawing No. 6.)

2 No. 3-0 "Wilsnap" dress snaps. For snapping nose plug to fuselage (Drawing No. 1.)

90 inches (7 1/2 feet) 1/8 flat rubber motor. For 3 loops (6 strands), 15 inches long.

1 piece of cellophane, 9/16 x 1 15/16. Front cabin window. (W-1 on Drawing No. 1.)

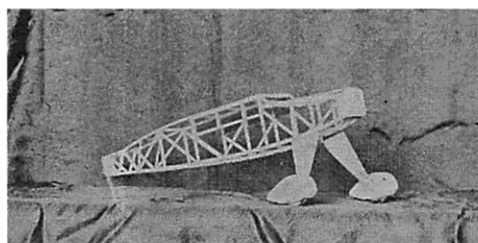
2 pieces of cellophane, 7/8 x 5. For the four side windows on each side of fuselage. (W on Drawing No. 1.)

Fine silk thread. For binding where specified.

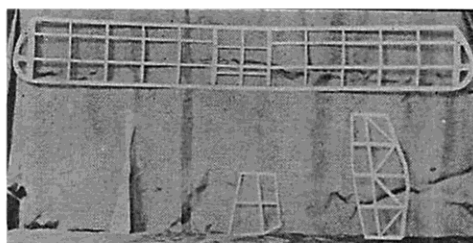
Many dimensions are omitted from the drawings as they are full-size. Measurement with a ruler will determine any desired dimension.

As most of the parts of the model are of balsa wood, all parts referred to in either the article or on the plans are understood to be of balsa (medium-hard), unless otherwise specified.

The original model was finished with yellow dope on body, landing gear struts, surfaces and pants, with black trim around strut edges, pant sides and cabin. The nose



The Fuselage skeleton, ready to cover



Wing, Stabilizer and Fin framework finished  
"Prop"

and propeller was silver.

Finish, of course, is optional with the individual builder. We shall start first with the fuselage.

### Fuselage

The fuselage, like the other parts of the plane, is shown full-size, and so the plans or tracings of them can be used directly as assembly patterns.

Pin drawings No. 1 and No. 2 or their tracings together upon a smooth board so that the top and side views of the fuselage are shown as one continuous layout. With a razor blade, cut to the sizes and angles the balsa pieces for the body sides and for the top and bottom cross-pieces. Lay wax paper over the plans to prevent glue sticking to them and then form a jig by driving pins or small finishing nails around the side and top views to hold the parts in place.

Set all the pieces for one side in the form except the diagonal marked "assemble last." Cement all joints and allow 30 minutes to set, then lift out frames and build up other side.

Next make the nose plate *g*, nose plug *h* and hanger support *h-1*. (The hanger support is cut from the  $\frac{1}{8} \times \frac{1}{4} \times 4$  piece given in the material list). The rest of this 4-inch piece is cut and sanded to size for the  $\frac{3}{32} \times \frac{1}{4} \times 2$  top front cabin edge, and the  $\frac{3}{32} \times 3/16$  tail-skid base. See Drawings (No. 1 and No. 2)

Bind and glue two steel hangers or thrust bearings of the dimensions shown, to the support *h-1*. At this point in the construction form the U-shaped hanger-brace *e* of No. 8 music wire and imbed into, and cement to, the front of the nose plug *h* in the position shown on Drawing No. 1. This will prevent the front hanger from bending back into the slot under an impact on the nose.

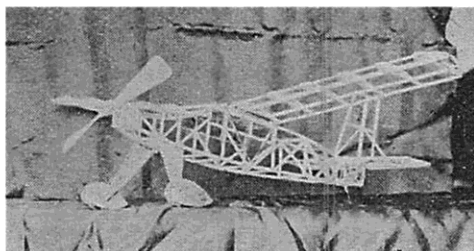
Now insert and glue the support *h-1* into the slot in the nose plug. (Note: The rear hanger is made longer than the front one so that the propeller shaft will set at a negative or downward angle. The line of thrust being down slightly will prevent the plane from stalling under power with the wing ahead in a good gliding position. If the model stalls on the glide, the rear hanger can be bent slightly back to a lower position, thus reducing the shaft angle.)

Cement halves of two No. 3-0 "Wilsnap" dress snaps onto the nose plate, and cement the other halves to the nose plug as shown. A neater fit can be made if you cut out slight circular depressions in the balsa to receive the snap halves.

Cut two pieces of cellophane (see material list) to fit the four window sections at the top of the body sides, marked "W," and cement to the sides so that the cellophane will be on the inside of both body sides when the fuselage is assembled.

Set the two side frames in the top view form and glue in place the middle bottom cross-pieces. Push the back of the structure down against the drawing, and glue in place the rear braces. Then reverse the frame on the plan and glue in the middle and rear top pieces in the same manner, including the  $\frac{3}{32} \times \frac{1}{4}$  cabin edging which is sanded off to a smooth rounded edge, after taking from form.

Next cement the front ends of the longerons into the grooves in the nose plate and wrap with thread to hold in place until dry. When set, remove the thread and insert upper and lower front cross-pieces, checking their position



The completely assembled skeleton

with a ruler. Now glue in the diagonals marked "assemble last." Cut out and notch the cowl formers *a*, *b* and *c* and the cowl stringer *d* and cement in place as shown. (Note: Do not overlook cementing in the four  $\frac{1}{16} \times \frac{3}{8}$  sheet balsa pieces all around the nose right back of the nose plate as these greatly aid in resisting headon shocks in flight.)

Form the can *f* for the rubber motor and glue and bind it to the  $\frac{3}{32}$  square  $\times 2$  piece as shown. Cement this unit to fuselage at the point indicated. This "can" will prevent undue vibration by keeping the rubber from thrashing around while unwinding.

Our next step on the body is to make the landing gear fittings of No. 10 music wire. After bending to shape, cement and bind with fine silk thread to the bottom longerons in the exact position shown on the drawing. The thread binding is very important at these joints. Be careful to get all four fittings evenly located from the front end of the body.

Make the wing-rubber grips of No. 10 music wire and cement to the fuselage at the points shown. The rear grips should be bound with thread about the bottom cross-bar at which they are located.

Cut a piece of cellophane to fit over the front window space marked "W-1" on the plan or top view, and cement in place. When dry, glue over the cellophane a molding of  $\frac{1}{32} \times \frac{1}{16}$  strips.

Referring now to Drawing No. 2, make up the tail plug and its wire fittings as shown; also the tail-skid which is cemented to the  $\frac{3}{32} \times \frac{3}{16}$  base on the bottom of the fuselage.

Before covering the fuselage, glue in place the landing gear axle guide (see Drawing No. 3 and text on landing gear). When ready to cover body proceed as follows: Cover both sides of the fuselage from the nose plate to the door outline with a medium weight rice paper; also cover the top from the nose plate to the window with the same weight paper. Cover the first three panels of the bottom with rice paper, carefully sealing the space around the protruding pine pieces of the axle guide. (See landing gear details, Drawing No. 3.) Using a heavier paper on the nose helps

strengthen the front of the plane. Heavy—that is, "straight"—wing dope makes a fine paper cement and produces a neat job. However, straight dope thinned with 50% of acetone works very well if you apply the paper to the frame a section at a time and work quickly.

Cover the rest of the fuselage with "Superfine" tissue

An Interesting  
Model to Build,  
and One Which  
Will Reward You  
With Excellent  
Flights

and apply a coat of light dope to all body surfaces after trimming the paper edges off with a razor blade. A coat of silver dope on the nose and black trimming around the windows adds a great deal to the appearance of the fuselage.

Finally cement four ( $1/16$  square x 2) "wing strip" pieces to the top of the body just back of the front window. These strips are shown on the side elevation of Drawing No. 1, but not on the top view. Space these pieces  $3/32$ " apart. The angle of incidence piece on the leading edge of the wing (Drawing No. 5) fits between them and they keep the wing from sliding back along the body during flight.

### Landing Gear and Pants

With a razor blade cut out the struts from  $1/32$  sheet. Cut so the grain runs parallel with the front edge of the strut. The strut is notched out at its bottom so the thread binding of the axle will not slip. Drawing No. 3.

Next cut out the thin bamboo braces and the small balsa strut pieces and glue them to the struts. Have the glossy side of the bamboo away from the balsa. As one strut will be left and one right, the braces must be glued to the opposite side of one strut with respect to the other strut. With a very sharp razor blade cut to size from  $1/8$  square balsa the hinge blocks shown on the plan at the top of the strut.

Bend the No. 10 music wire hinges and insert into the blocks. Cement the hinges to the blocks and bind with fine silk thread; then cement the blocks to the struts, locating them very carefully in their proper positions.

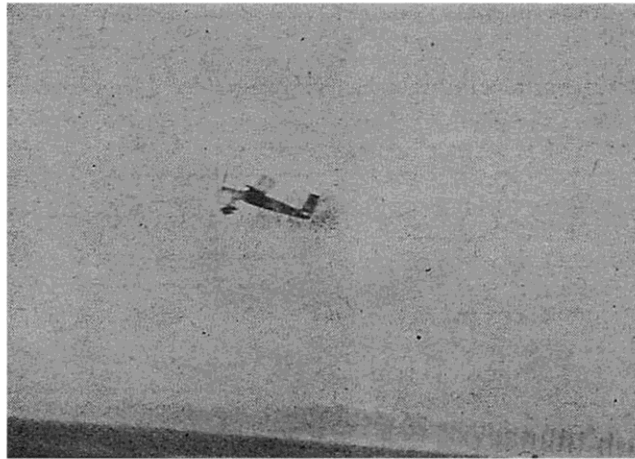
Form the No. 10 music wire axle, and glue and bind to each strut as shown. Note how the center part is bent to slide in the axle guide—form this part accurately to the plan so it will not bind or be too loose when assembled in the guide. Cover the inside of each strut with "Superfine" tissue to streamline, and dope lightly.

We shall now make the pants. From  $1/32$  sheet cut out four pant sides to the inside outline on the side view on Drawing No. 3. Punch a hole for the axle with a piece of No. 10 wire through each side piece at the point shown on the drawing. Cut to size the side spacers (a), (b), (c), (d) and (e), two of each. Glue each (a) piece between two pant sides in the front position shown. After the cement has set, glue in the rear spacers (e) and hold in place with thread lashing until dry. When the rear pieces have set, remove the thread and insert in place and cement the spacers (b), (c) and (d).

Now prepare the covers for the pants by cutting out pieces (g) from  $1/32$  sheet, making them slightly wider than the size required as indicated on the drawing. Cut them out so the grain runs *cross-wise*, that is, at right angles to the pant sides. Although you will probably have to use more than one piece to cover the top this way, it will enable you to bend and glue the pieces around the curve of the pant much more easily and smoothly.

After glueing on the cover pieces, trim flush to the sides with a razor blade and then sand all edges smooth with fine sandpaper. (Note: You will have to glue on the bottom pieces after the wheels have been assembled.)

Now cut out two ( $1/16$  x  $1/8$  x  $1/4$ ) pant pieces and



Gaining altitude after the "take off"

cement one to each pant (opposite respective sides, of course) exactly  $7/8$ " in from the front end of the pant and  $7/32$  down from the top of the pant. Cut out the  $1/16$  x  $1/4$  x  $3/8$  pants-to-strut braces and bevel their ends to match the front end view of the pant assembly on the drawing. Cement them to the pants and lay away to dry.

Glue a small  $1/4$ " diameter washer to each side of each wheel at the hub. ( $1 1/4$ " is the proper wheel diameter for this pant size.) Apply two coats of wing dope to the wheels to strengthen them

and then slip one of the wheels into a pant and run the pant and wheel onto the axle together. Now glue the beveled projecting end of the pant-to-strut brace to the landing gear strut snug under the  $1/16$  x  $1/8$  x  $1/4$  piece on the strut as shown in the front pant assembly view. Be sure the pant assembly lines up squarely with the strut. Proceed likewise with the other wheel and pant and then glue on the bottom pieces of the pants.

Our next step is making the axle guide and support. Cut from  $1/16$  sheet balsa the web and triangle horizontal braces shown in the detail of the axle guide and glue them together to form the support. Prepare the pine pieces for the guide from the ( $1/16$  x  $1/8$  x 2) pine piece given in the general material list and glue the two  $7/8$ " long pieces to the support; the bottom piece is cemented on the last thing after assembling the axle in the guide.

Take the fuselage and carefully locating the guide support in its proper position in the bottom of the body, cement it in place. See Drawing No. 1.

Now bend the hinging pins and then carefully pin in place the struts to the fuselage. Slip the center of the axle between the two guide pieces and spread the wheels with the fingers to test the spring in the axle. Last, glue on the small  $3/8$ " long pine piece onto the bottom of the guide. This completes the landing gear.

### Stabilizer and Rudder

The plans of the tail and rudder are shown full-size on Drawing No. 4. Notch and assemble the ribs and ends to the spar first. Then splice the leading edge, and glue that and the trailing edge in place. True up and allow to set. Next sand the ribs and spar ends to a taper and then glue in place the diagonals and small blocks shown.

The small ( $1/16$  x  $1/8$  x  $1/4$ ) pieces at the center rib make a more solid foundation for glueing the stabilizer to the body, while the ( $1/16$  square x  $1/4$ ) pieces form a place to receive the ends of the  $1/32$  round bamboo rudder braces without weakening the spar. The diagonals reduce warping tendency when the tail is doped or later subjected to weather changes.

The stabilizer is covered on both sides with "Superfine" tissue and treated with a coat of light dope. Black India ink lines drawn on the top and bottom of the tail along the spar line improve the appearance by representing the flippers or elevators.

The rudder is built up in a manner similar to the tail; however, in making the rudder it is better to drive pins around the drawing or its tracing and insert the parts in the form before cementing them together, as was done with the fuselage. The middle

(Continued on page 22)

vertical spar is notched at one end to receive the top edge piece, after which the spar is tapered  $\frac{3}{4}$ " from the top out to the end. The middle horizontal rib is made of two pieces butted against each side of the spar and notched at their ends for the leading and trailing edges. After the complete rudder assembly they and the bottom rib pieces are tapered with sandpaper from the vertical spar out to the leading and trailing edges. The bottom pieces are notched and assembled the same as the center rib pieces.

Cover the rudder in the same manner as the stabilizer and paint or ink the spar line "black," on each side for the rudder hinge line.

Sand away carefully the paper on top of the center rib of the stabilizer and cement the rudder to the tail, offsetting it  $\frac{3}{32}$ " as shown on the drawing.

Shave and sand to size the bamboo rudder braces. Drill a small hole in the rudder spar on each side where the middle rib comes and drill holes in the small blocks on the tail by the middle ribs. Cement the bamboo braces into these holes, being careful to have the rudder as near perpendicular to the tail as possible.

Sand away lightly the covering on the bottom of the spar where it joins to the body and glue the tail and rudder unit to the fuselage, butting the leading edge of the stabilizer flush against the  $\frac{1}{16}$  square piece on top of the body. See Drawing No. 2. Be sure the stabilizer is square with the body.

### Wing

The wing consists of three parts: The center section, the right half and the left half. The high-lift ribs are cut from  $\frac{1}{32}$  and  $\frac{1}{16}$  sheet and the spars and edges are notched into them. Drawing No. 5.

The spars of the center section are cut at an angle at their ends and the two outer ribs cemented on at an angle so that when the halves of the wing are glued to the center part they will form with each other the necessary dihedral for stability.

After building up the two halves and center section of the wing, apply a liberal coat of cement to the inner rib of one of the halves and cement and bind with strong linen thread to the center section. Run pins into the ribs so they will not slip out of line while being wrapped. Do the same with the other wing half, and when the cement has set remove the pins and thread.

Cover the top of one wing with "Superfine" tissue, using wing dope to stick the paper to the frame. Work from the inner rib out, doping each rib one at a time and rubbing the paper down until it sticks. After the paper has been stuck to all ribs and the tip, dope the outside of the edges a section at a time and stick down the paper. Trim with a razor blade and apply one coat of light dope. Weight down around the edges for 30 minutes while the dope is drying. Then proceed likewise with the top of the other half of the wing and the top of the center section. Next cover one side on the bottom, dope and weight down, and then cover the other bottom side and center section, and dope. (Note: While the under surfaces are drying they should be raised up on books or boards so the air will circulate under the wing.)

After covering, cement on the ( $\frac{3}{32} \times \frac{3}{16} \times 3$  elevation or angle of incidence piece to the under side of the center section leading edge. Sand away lightly the paper so the cement will hold to the wood of the leading edge. You can use two pieces of  $\frac{3}{32}$  square glued together to form this elevation piece.

Paint a black line, top and bottom, around the line of the rear spar, trailing edge and rear portion of the end rib, and the rib second from the end one, on both wing halves. This marking represents the

ailerons.

The wing is held onto the fuselage by means of two  $\frac{1}{8}$  flat rubber loops about  $3\frac{1}{2}$  inches long. (Not given in material list.) A loop is used on each side of the body. Each band is hooked around the two wing hooks on one side of the fuselage and then stretched with the fingers above the fuselage and the wing is slipped through the loop and across the top of the body.

### Propeller

THE propeller is carved from a Langley type true-pitch blank, ( $\frac{5}{8} \times 1 \times 7\frac{1}{2}$ .) "Coping saw" cuts, made in the block in to the "boss," will make it easier to cut the blank out. Carve the blades to about  $\frac{1}{8}$ " thickness at the hub, tapering to  $\frac{1}{16}$ " thickness at the tips. Drawing No. 6.

Drill a  $\frac{1}{32}$  hole for the propeller shaft. Round off the tips of the blades and sandpaper to a smooth finish with (OO) sandpaper, carefully balancing the propeller. Make the bearing plate as shown in Drawing No. 6 and cement to the back of the hub. This prevents the washers' wearing into the wood.

Give the propeller two coats of dope, sanding with (OO) paper between each coat and after the last one. Check again for balance.

Prepare the propeller shaft to plan and cut off the brass tubing bearing piece. Take the nose plug and run the shaft through from the back. Slip on the washers and tubing piece in the position shown. Fit on the propeller, and after carefully bending back the front end of the shaft, sink it back part way into the hub. Cut a piece of No. 10 music wire  $\frac{1}{4}$ " long, and insert it under the bend in the shaft, across the front face of the hub, so that the shaft will straddle it. Now push the hook of the shaft all the way into the hub, tight against the  $\frac{1}{4}$ " wire piece and apply a coat of cement. The shaft straddling the wire will be unable to rip through the soft balsa under the pull of the rubber. The propeller may be finished with a coat of silver dope.

The motive power is supplied by six strands of  $\frac{1}{8}$  flat rubber, which, if lubricated with glycerine, will stand about 600 turns given through a 5 to 1 winder. The rubber can be stretched out the back of the fuselage by means of the tail plug and winding hook.

The usual course is followed in making flying adjustments, namely, moving the wing ahead if the plane dives and moving it back if the ship stalls. Also some adjustment can be made by means of the rear propeller hanger as noted in the description of the fuselage construction.

The model takes off very nicely and with proper setting, it should fly about 500 feet.